We claim:

1. A process for compression molding of a fine grained mixture of a resin and at least 50% filler material into a highly detailed molded part, comprising the steps of:

forming, at a first pressure, a preform of resin and filler mixture in a predetermined weight sufficient for molding the molded part, the cross sectional area of the preform being substantially less than the area of the part to be molded;

positioning the preform in a mold cavity at about the geometrical center of the product outline; and

molding the preform into the molded part by compressing the preform between mold segments defining the mold cavity in a molding machine which closes and applies pressure to the halves of the mold cavity to apply a second pressure to the molded part within a time interval sufficient to fluidize and flow the material to all parts of the mold cavity prior to the onset of curing of the resin in the mold.

2. The process of claim 1 wherein the first pressure is at least 400 psi.

3. The process of claim 1 wherein the second pressure is at least 300 tons.

4. The process of claim 1 wherein the time interval is within about 0.5 to 3 seconds.

5. The process of claim 1 wherein the filler material is graphite.

6. The process of claim 5 wherein the graphite comprises at least about 50% of the mixture by weight.

7. The process of claim 1 wherein the forming of the preform is performed on a separate press

8. The process of claim 1 wherein the preform is maintained in a climate controlled environment between the forming and the molding steps.

9. The process of claim 1 wherein the molding process also includes applying a vacuum to the mold cavity as it is closed and maintaining the vacuum in the mold cavity throughout the molding process.

10. A machine for molding a plate from a thermosetting preform material using a thermosetting compression molding process, the machine comprising:

a first platen and mold cavity portion;

a second platen and mold cavity portion, the first and second mold cavity portions constructed and arranged for receiving in a mold cavity thereof a preform comprising a thermosetting resin and at least about 50% by weight of a graphite filler material; and

a press for performing a molding operation by rapidly forcing the first and second platen and mold cavity portions together in an interfitting relationship, thereby compressing the preform material into a molded part with features therein defined by the first and second cavity portions .

11. The machine of claim 10 wherein the first and second platens each also comprise a plurality of heating elements embedded therein, the heating elements constructed and arranged for maintaining a selected elevated temperature of the first and second cavity portions during the molding operation.

12. The machine of claim 11 wherein temperature sensors are embedded in the

first and second platens adjacent to at least one of the of the heating elements for providing a measurement of the platen temperature to temperature control circuitry driving heating elements adjacent to the temperature sensors.

13. The machine of claim 12 wherein each temperature sensor is positioned adjacent at least one heating element and temperature control circuitry associated with it controls the temperature of those heating elements.

14. The machine of claim 12 wherein the selected elevated temperature lies in a range between about 270 and 320 degrees Fahrenheit.

15. The machine of claim 14 wherein the selected elevated temperature is maintained to within 5 to 10 degrees Fahrenheit across the molded part throughout the molding operation.

16. The machine of claim 10 wherein the press opens the mold cavity by separating the mold cavity portions and at least one of the first and second cavity portions also comprises ejection devices positioned at various locations across the surface of the molded part, the ejection devices constructed and arranged for actuation during the opening of the cavity defined by the first and second cavity portions.

17. The machine of claim 16 wherein both of the first and second cavity portions comprise ejection devices.

18. The machine of claim 16 wherein the ejection devices comprise a plurality of ejector pins mounted on a separate ejector plate for movement relative to a cavity portion during actuation to apply an ejection force to the molded part as the mold

cavity opens.

19. The machine of claim 10 wherein the molded part includes at least one diaphragm area having a thinner web of molded material therein which is readily removable from the molded part when it is put in use and wherein both of the first and second cavity portions also comprise ejection devices at various locations across the surface of the diaphragm areas of the molded part, the ejection devices constructed and arranged for actuation during the opening of the mold cavity.

20. The machine of claim 10 wherein the first and second platen and mold cavity portions also comprise interfitting vacuum seals and the machine also includes vacuum manifolds communicating to the mold cavity for establishing a partial vacuum between the first and second mold cavities during the molding operation.

21. The machine of claim 20 wherein the partial vacuum is established in the mold cavity before the mold cavity portions are fully closed.

22. The machine of claim 10 wherein the first and second cavity portions are formed from tool steel coated with Teflon.

23. The machine of claim 10 wherein outside edges of the first and second cavity portions when the mold cavity is fully closed are constructed and arranged for providing a parting line gap of about approximately .007 inches remains open around the perimeter of the part upon completion of the molding operation.

24. The machine of claim 23 wherein the first and second cavity portions have a projecting land portion around substantially their entire circumference at the parting line, the land potions each being parallel to each other and the face of the

molded part and separated from each other by about approximately .007 inches when the first and second cavity portions are in a closed position.

25. The machine of claim 10 wherein the press applies a molding pressure of at least about 300 tons within about 0.5 to 3 seconds as the molding operation is performed.

26. In a machine for molding a plate from a thermosetting preform material using a thermosetting compression molding process driven by a high pressure press, a mold assembly comprising:

a first platen and mold cavity portion;

a second platen and mold cavity portion, the first and second mold cavity portions constructed and arranged for receiving in a mold cavity thereof a preform comprising a thermosetting resin and at least about 50% by weight of a graphite filler material, the first and second mold cavity portions constructed and arranged for performing a molding operation when the press rapidly forces the first and second platen and mold cavity portions together in an interfitting relationship and compressing the preform material into a molded part with features therein defined by the first and second cavity portions.

27. The machine of claim 26 wherein the first and second platens each also comprise a plurality of heating elements embedded therein constructed and arranged for maintaining a selected elevated temperature of the first and second cavity portions during the molding operation.

28. The machine of claim 27 wherein the selected elevated temperature lies in a range between about 270 and 320 degrees Fahrenheit.

29. The machine of claim 26 wherein the selected elevated temperature is maintained to within 5 to 10 degrees Fahrenheit across the molded part throughout the molding operation.

30. The machine of claim 26 wherein the mold cavity portions are separable to open the mold and at least one of the first and second cavity portions also comprises ejection devices positioned at various locations across the surface of the molded part, the ejection devices constructed and arranged for actuation during the opening of the cavity defined by the first and second cavity portions.

31. The machine of claim 30 wherein both of the first and second cavity portions comprise ejection devices.

32. The machine of claim 30 wherein the ejection devices comprise a plurality of ejector pins mounted on a separate ejector plate for movement relative to a cavity portion during actuation to apply an ejection force to the molded part as the mold cavity opens.

33. The machine of claim 26 wherein the molded part includes at least one diaphragm area having a thinner web of molded material therein which is readily removable from the molded part when it is put in use and wherein both of the first and second cavity portions also comprise ejection devices at various locations across the surface of the diaphragm areas of the molded part, the ejection devices constructed and arranged for actuation during the opening of the mold cavity.

34. The machine of claim 26 wherein vacuum providing means are provided for establishing a partial vacuum between the first and second mold cavities during the molding operation.

35. The machine of claim 26 wherein the first and second cavity portions are formed from tool steel coated with Teflon.

36. The machine of claim 26 wherein outside edges of the first and second cavity portions when the mold cavity is fully closed are constructed and arranged for providing a parting line gap of about approximately .007 inches remains open around the perimeter of the part upon completion of the molding operation.

37. The machine of claim 36 wherein the first and second cavity portions have a projecting land portion around substantially their entire circumference at the parting line, the land potions each being parallel to each other and the face of the molded part and separated from each other by about approximately .007 inches when the first and second cavity portions are in a closed position.